Technology Demonstration Fact Sheet
Self Contained Pipe Cutting Shear

SUMMARY

On March 24, 1997, a Lukas Hydraulik (model LKE 70) self contained pipe cutting shear was demonstrated in the 105-C Reactor area and a series of pipes ranging from 1-inch to 3- inch diameter were cut. The purpose of these activities was to compare the capability of this innovative technology to the baseline technology currently practiced at the Hanford 105-C Reactor Safe Storage Project.

Results of this technology demonstration are as follows:

- The pipe cutting shear demonstrated good cutting capability for 1- and 2-inch pipes.
- The tool had difficulty cutting through 3-inch pipe.
- This tool successfully cut 1-inch pipes attached to a wall without the need to unclamp the pipe holders from the wall.

INNOVATIVE TECHNOLOGY DESCRIPTION

The Lukas model LKE 70 is a self contained pipe cutting shear that does not require any hydraulic fluid lines. This shear has a built-in accumulator that uses approximately 1 pt of hydraulic fluid. The shear's weight is approximately 50 pounds and is easy to carry and use with the sling provided. Its dimensions are 33.5 inches long, 10.2 inches wide, and 6.8 inches high. It also has a built-in rechargeable battery that allows 0.25 hr of continuous operation. This tool can be attached to a portable, easy to carry external rechargeable battery that allows the user an extended period of operation (approximately 0.5 hr additional).

BASELINE TECHNOLOGY DESCRIPTION

Three different tools were used to demonstrate the baseline technology:

- German saw (electric-powered hack saw)
- Porta-Band saw
- Hydraulic shear

A German saw was used to cut 1-in and 3-inch clean pipes inside the 105-C Reactor building. This saw has a clamp and feed attachment for clamping the saw to pipes and guiding saw blade into the surface being cut. This saw was used to cut two 1-inch pipe sections and five 3-inches pipe sections. This saw was observed to be more appropriate for larger diameter pipes (3-inches diameter and larger). For smaller pipes, the clamp and feed attachment could not hold the saw blade in its position properly and was slipping. It had a fairly short set up time (6 min 10 sec average). The cut durations were 2.5 and 3 minutes for 1- and 3-inch pipes, respectively, and the cut edges looked fairly smooth and clean.

The same types and sizes of pipes were cut using the Porta-Band saw. With this band saw there were five cuts for each type of pipe. It had a fairly short set up time (3 minutes average). Cut durations were approximately 12 and 42 sec for 1- and 3- inch pipes, respectively, and the cut edges were fairly smooth and clean.

The same types and sizes of pipes were cut using the baseline hydraulic shear. There were five cuts for each 1-inch pipe, 3 cuts for 2-inch pipe, and 3 cuts for 3-inch pipe. It had a fairly short set up time (1 to 3.5 min on the average). The cut durations were approximately 20, 46, and 210 seconds for 1-, 2-, and 3-inch pipes, respectively, and the cut edges were rough and jagged, where it had difficulty cutting 3-inch pipe. This tool needs both a hydraulic line and an electric cord to operate it.

All of these tools seemed to have some difficulties in tight and congested areas.

DEMONSTRATION DESCRIPTION

For the innovative technology demonstration, the same types and sizes of pipes that were cut in the

baseline demonstration were cut using the self contained pipe cutting shear. This innovative technology was used to perform five cuts for 1-inch pipe, two cuts for 2-inch pipe and one cut for 3-inch pipe. Additional cuts were made on a 1-inch pipe attached to a wall; there was no need to move the pipe off the wall first, as would have been required with baseline tools. It had a fairly short set up time (approximately 1.5 to 2.5 minutes on the average). The cut duration was approximately 30 seconds for both 1- and 2-inch pipes, but it could not cut the 3-inch pipe in spite of repeated attempts (7 times). The cut edges were fairly smooth and clean. This tool (and the baseline shear) crimp the pipe as it cuts, which is advantageous if the pipe is internally contaminated. The pipe ends were approximately 80% to 90% closed (depended on the pipe size; the larger the pipe diameter, the smaller the crimp percentage). The unit operated quietly and did not produce residual cuttings. The unit was awkward and heavy to set in place where pipes were located above the normal sling position near the worker's waist. This tool had some difficulties in tight and congested areas, but had less clearance problems than the baseline tools in certain situations.

As part of this demonstration this unit was used continuously with a total of 88 additional cuts until both batteries were completely discharged (equivalent to 1 hour 4 minutes of continuous operation). The discharged batteries were then fully recharged in a period of 2 hours.

DETAILS OF BENEFITS

This tool provides the ability of cutting pipes attached to walls without needing to loosen the pipe hangers, hydraulic fluid supply lines and/or an electric cord to energize and operate the tool. This was especially true for the 1-inch and 2-inch pipe sizes.

Shears (whether battery operated or not) have an advantage over saws, with reduced risk of creating airborne contamination while performing the cuts on internally contaminated pipes and pipes covered with lead based paint.

Shears do not produce residual cuttings, which is an advantage for radiologically contaminated and lead-painted pipe.

SUCCESS CRITERIA

- Reduces the need for hydraulic fluid supply lines and/or an electric cord; less equipment to deal with, especially in highly contaminated and higher radiation areas (ALARA)
- Reduces the chance of creating airborne contamination when compared to saws
- Reduces the chance of contamination release from internally contaminated pipes when compared to saws.

SCHEDULE

This demonstration was performed in March 24, 1997.

FUTURE APPLICABILITY

This tool can be used for 2-inch and smaller diameter pipes and conduits mounted on the walls, where other types of tools may not perform well without separating pipes from the walls. Also, it is useful in areas with pipes having internal contamination or painted with lead based paint.

Average Cutting Time (min:sec)

Saw Type	1" ∅ / # of cuts	2" ∅ / # of cuts	3" ∅ / # of cuts
German Saw	01:44 / 2	N/A	02:50 / 5
Bandsaw	00:12 / 5	N/A	00:41 / 5
Hydraulic Shears	00:20 / 5	00:46 / 2	03:31 / 3
Self Contained Shears	00:31 / 5	00:46 / 2	Couldn't Cut

CONTACT PERSONS

John Duda, FETC, (304) 285-4217
Shannon Saget, DOE-RL, (509) 372-4029
Jeff Bruggeman, DOE-RL, (509) 376-7121
Stephen Pulsford, BHI, (509) 372-9683
Chris Lukas, LRT, (540) 891-6600